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(54) Sewer relining

(57) An existing sewer run (10) which extends generally horizontally and which has access to the ground surface via at least one upwardly extending manhole shaft (12) is relined by feeding a first pipe length (14) of plastics material into the sewer (10) via the manhole shaft (12), the first pipe length having a wall which is corrugated to permit of resilient deformation of the portions of the pipe length as they bend in order to pass from the manhole shaft to the sewer, and feeding a second pipe length (15) into the first pipe length (14), the second pipe length having a smooth external surface to permit of easy insertion of the second pipe length (15) into the first length (14), and having a smooth internal surface which forms a low friction sewage-conveying surface for the composite liner thereby formed in the existing sewer by the first and second pipe lengths.

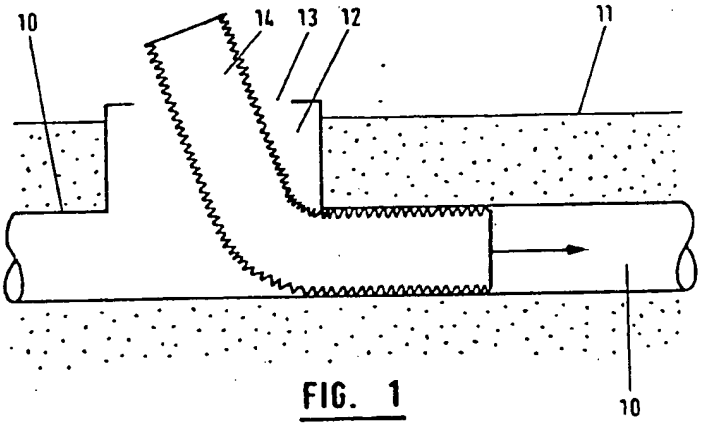

FIG. 1

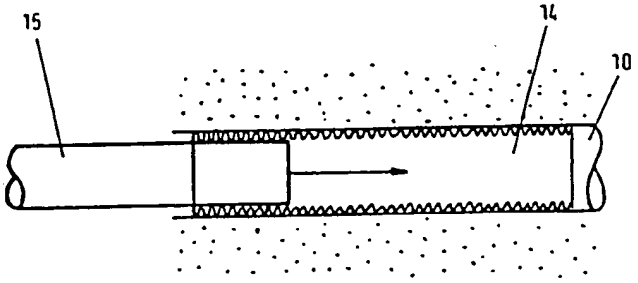

FIG. 2

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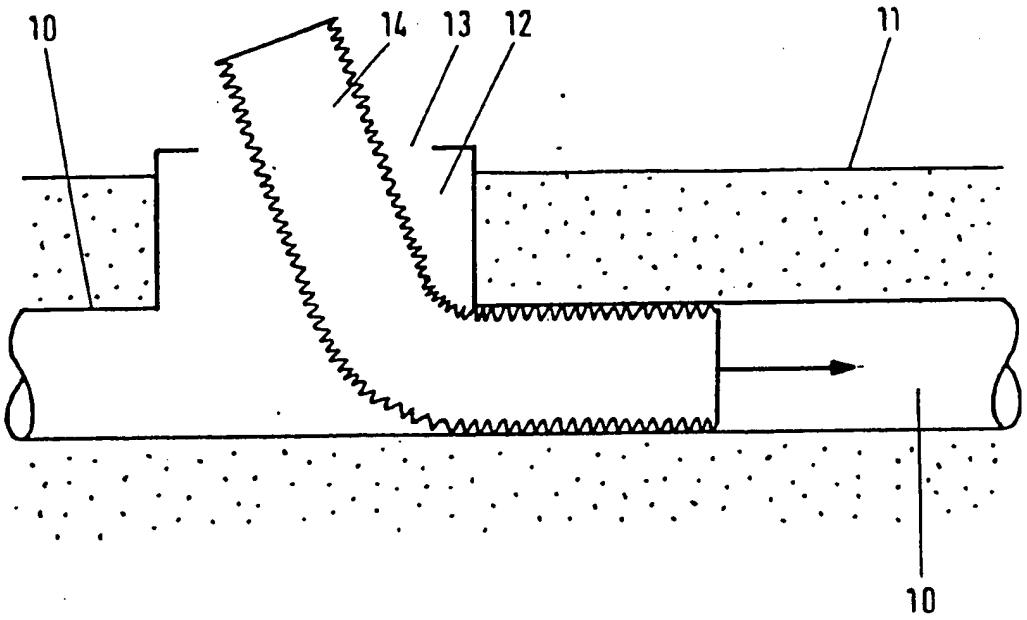

FIG. 1

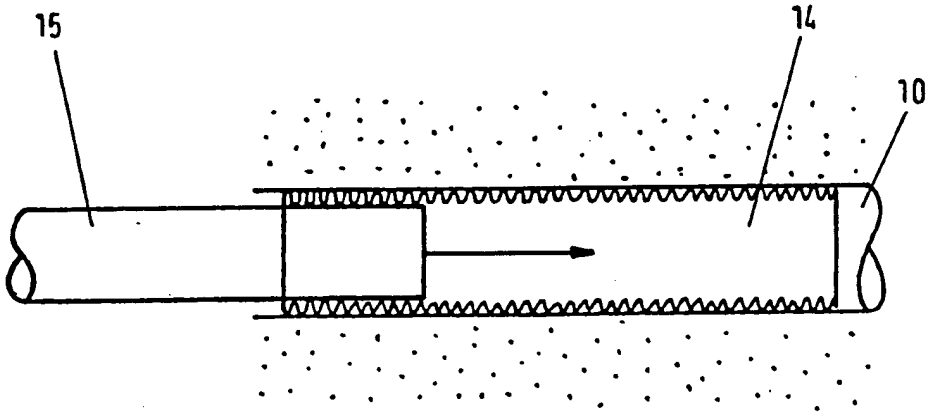

FIG. 2

SPECIFICATION

Sewer re-lining

This invention relates to the renovation or relining of existing sewers.

It is known to renovate existing deteriorating sewers by introducing a liner into the sewer, so that the outer surface of the liner lies adjacent to the (deteriorating) inner surface of the existing sewer wall. Plastics pipes are particularly suitable for this means of renovating sewers, since plastics pipe lengths can be fairly readily pushed, or drawn along the sewer, without any excavation being necessary, other than that required to allow access to be had to one end of the sewer run which is to be renovated.

Existing pipes made of plastics material (for use in re-lining sewers) have a certain degree of resilience, though not to a sufficient extent as to allow very substantial bending of the pipe simultaneously with generally longitudinal movement. It is for this reason that it is necessary to excavate at least one end of a sewer run, to enable the liner to be manipulated and fed into the sewer generally parallel to the axis thereof. It is impossible, with existing plastics pipes for relining sewers, to feed such pipes into a sewer while forcing the pipes to undergo severe bending.

Therefore, it is not possible to feed a liner of plastics pipe from above the ground and into a sewer (without excavation) and through a manhole, in view of the severe bending which would be necessary as the pipe passes from the near vertical, as it goes down through the manhole shaft, to the generally horizontal as it is taken into the sewer.

Accordingly, there is a clear need to provide a means which will facilitate the re-lining of existing sewers (by avoiding the necessity for exacavation), and enable pipe lengths (for re-lining purposes) to be fed into a sewer from above the ground and via a manhole.

According to the invention there is provided a method of re-lining an existing sewer run which extends generally horizontally and which has access to the ground surface via at least one upwardly extending manhole shaft, the method comprising:

feeding a first pipe length of plastics material into the sewer via the manhole shaft, the first pipe length having a wall which is corrugated to permit of resilient deformation of the portions of the pipe length as they bend in order to pass from the manhole shaft to the sewer;

and feeding a second pipe length into the first pipe length, the second pip length having a smooth external surface to permit of easy insertion of the second pipe length into the first length, and having a smooth internal surface which forms a low friction sewage-conveying surface for the composite liner thereby formed in th existing sewer by the first and second pipe lengths.

The first pipe length, being made of corrugated plastics material, provides the dual advantage of a) mechanical strength to the existing sewer by virtue of its good moment of inertia characteristics and b) sufficient flexibility for the first pipe length to deform without difficulty as it negotiates any severe bends, and particularly the approximately 90° bend as it passes from near vertical movement through the manhole shaft near horizontal movement along the sewer. In addition, the first pipe length (being made of plastics material), is water proof and is able to resist both infiltration and exfiltration.

The second pipe length, which is introduced into the first pipe length only after the latter has been introduced into the sewer, gives rigidity to the composite liner thereby formed, and also provides a bore of low friction for the conveyance of sewage.

The first pipe length provides the major portion of the strength of the composite liner, and the second pipe length can therefore be made with a relatively thin wall since it is not required to provide any significant contribution to the strength of the composite liner, or to be water proofed.

The second pipe length may conveniently be built up from a succesion of relatively short pipe elements which are introduced one after the other into the first pipe length when the latter is *in situ* in the existing sewer, and no jointing is necessary between each adjacent pair of pipe elements. Conveniently, the pipe elements are made of plastics material.

To facilitate transport and subsequent manipulation of the first pipe length, it is preferred that the first pipe length should be made so as to be capable of being stored on a reel, from which the pipe length can be payed-out as it is taken downwardly through the manhole shaft and into the sewer.

The method according to the invention is applicable for use with existing sewers made of any of the conventional materials, including brickwork, and concrete pipe.

The invention will now be described in detail, by way of example only, with reference to the accompanying schematic drawing in which:

Figure 1 is an illustration of the introduction of a first pipe length into an existing sewer in a method according to the invention; and

Figure 2 illustrates the introduction of a second pipe length into the first pipe length, when *in situ* in the existing sewer, to form a composite liner in the sewer.

Referring now to the drawing, an existing sewer, which is assumed to be deteriorating and in need of renovation and re-lining, is designated generally by reference numeral 10. The sewer 10 is buried in a trench below the ground surface 11, and has access to the

ground surface by a number of upwardly ext nding manhol shafts 12. In service, the manhole shaft 12 will have a r movable metal cover (not shown) which fits over an entrance opening 13 defined at the upper end of the manhole shaft 12.

The method according to the invention enables the sewer 10 to be re-lined, employing a first pipe length 14 which is introduced into the sewer 10, as shown in Fig. 1, and a second pipe length 15 which is introduced into the first pipe length 14 only after the latter is *in situ* within the sewer 10.

The first pipe length 14 is made of plastics material, and can be fed into the sewer 10 via the manhole shaft 12 from a reel supply (not shown) on the ground surface. The first pipe length 14 has a wall which is corrugated to permit of resilient deformation of the portions of the pipe length 14 as they bend in order to pass from the manhole shaft 12 to the sewer 10. The particular shape imparted to the corrugations is not critical, provided only that they give a good moment of inertia property, and therefore provide substantial mechanical strength to the existing sewer when *in situ*, while also giving sufficient flexibility the pipe length to enable the necessary bending to take place simultaneously with generally longitudinal movement.

The first pipe length 14 must be manufactured so as to provide the major portion of the strength properties of the composite liner formed by the first pipe length 14 and second pipe length 15, and should be water proof so as to resist infiltration and exfiltration.

Referring to Fig. 2, following introduction of the first pipe length 14 into the sewer 10, the second pipe length 15 can then be fed into the first pipe length 14. The second pipe length 15 is preferably made of plastics material, and has a smooth external surface to permit of easy insertion of the pipe length into the first pipelength. It also has a smooth internal surface which forms a low friction sewage-conveying surface or bore for the composite liner thereby formed in the existing sewer 10 by the first and second pipe lengths.

The second pipe length does impart rigidity to the composite liner, upon insertion into the first pipe length, but it is the first pipe length which provides the major proportion of the strength characteristics of the composite liner. Therefore, the second pipe length, which effectively is only a secondary pipe, can be fabricated with a relatively thin wall, since it does not need to be strong or water proof. Conveniently, the second pipe length is also made of plastics material, and may be built-up from a series of relatively short pipe elements which are introduced one after the other into the first pipe length 14 when the latter is *in situ* in the existing sewer. No jointing is necessary between each adjacent pair of pipe element from which the second pipe length is formed.

Having regard to the above description of one preferred means for carrying out a method according to the invention, it will be evident that there is disclosed herein a means which will facilitate the re-lining of existing sewers, by avoiding the necessity for excavation, and which enables pipe lengths (for relining purposes) to be fed into a sewer from above the ground and via a manhole shaft.

CLAIMS

1. A method of re-lining an existing sewer run which extends generally horizontally and which has access to the ground surface via at least one upwardly extending manhole shaft, the method comprising:

feeding a first pipe length of plastics material into the sewer via the manhole shaft, the first pipe length having a wall which is corrugated to permit of resilient deformation of the portions of the pipe length as they bend in order to pass from the manhole shaft to the sewer;

and feeding a second pipe length into the first pipe length, the second pipe length having a smooth external surface to permit of easy insertion of the second pipe length into the first length, and having a smooth internal surface which forms a low friction sewage-conveying surface for the composite liner thereby formed in the existing sewer by the first and second pipe lengths.

2. A method according to claim 1, in which the first pipe length provides the major portion of the strength of the composite liner, and the second pipe length is made with a relatively thinner wall.

3. A method according to claim 1 or 2, in which the second pipe length is built-up from a succession of relatively short pipe elements which are introduced one after the other into the first pipe length when the latter is *in situ* in the existing sewer.

4. A method according to claim 3, in which the pipe elements are made of plastics material.

5. A method according to any one of the preceding claims, in which the first pipe length is made so as to be capable of being stored on a reel, from which the pipe length is payed-out as it is taken downwardly through the man hole shaft and into the sewer.

6. A method according to any one of the preceding claims, in which the existing sewer run is made of any conventional materials, including brickwork, and concrete pipe.

7. A method according to claim 1 and substantially as hereinbefore described with reference to, and as shown in the accompanying drawing.

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